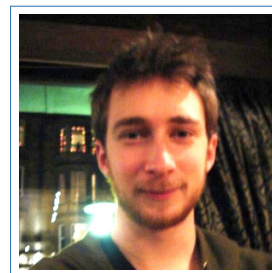


Robin Lamarche-Perrin

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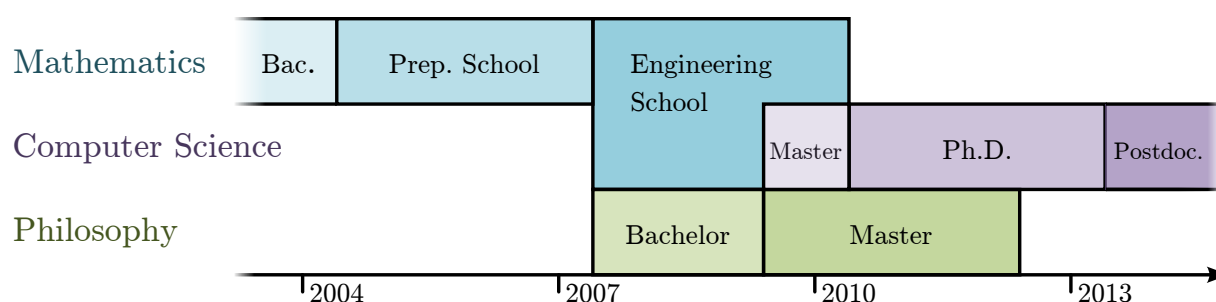
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Education

- 2010–present **Ph.D. degree in Computer Science**, *Grenoble Informatics Laboratory (MAGMA & MESCAL teams), Joseph Fourier University, Grenoble.*
Supervised by Yves Demazeau and Jean-Marc Vincent. Funded by the French Ministry of Higher Education and Research. Oral examination scheduled for September 2013.
- 2009–2012 **Master's degree in Philosophy “History of philosophy and philosophy of language”**, *Pierre-Mendès-France University, Grenoble.*
Master theses [13] and [16] respectively supervised by Denis Perrin and Max Kistler. Graduated first (1/17) with highest honors (86/100, *mention Très Bien*).
- 2009–2010 **Master's degree in Computer Science “Artificial Intelligence and the Web”**, *Grenoble Informatics Laboratory, Joseph Fourier University, Grenoble.*
All courses in English. Master thesis [17] supervised by Jean-Marc Vincent and Yves Demazeau. Graduated first of the June session (1/45) with highest honors (80/100, *mention Très Bien*).
- 2007–2010 **Engineering degree in Computer Science and Applied Mathematics**, *Ensimag, Grenoble Institute of Technology.*
Graduated with honors (69/100, *mention Assez bien*).
- 2007–2009 **Bachelor's degree in Philosophy**, *Pierre-Mendès-France University, Grenoble.*
Graduated with honors (65/100, *mention Assez Bien*).
- 2004–2007 **Preparatory School for Engineering School (Mathematics and Physics)**, *Joffre High School, Montpellier.*
Accepted in the Ensimag engineering school of the Grenoble Institute of Technology in 2007.
- 2004 **Baccalaureate in Science (sp. Mathematics)**, *Lycée Philippe Lamour, Nîmes.*
Graduated with highest honors (85/100, *mention Très Bien*).



Ph.D. Thesis

Title *Building Meaningful Macroscopic Descriptions of Large-scale Complex Systems*
Institutions Grenoble Informatics Laboratory (LIG)
Joseph Fourier University (UJF), Grenoble
Supervisors Yves Demazeau (LIG-MAGMA, CNRS)
Jean-Marc Vincent (LIG-MESCAL, UJF)

Abstract This Ph.D. thesis deals with the observation and the analysis of natural or artificial systems. When it comes to large-scale or very complex systems, the observation of microscopic dynamics suffers *technical* and *semantic* limits: How to observe a million of distributed entities? How to interpret such a cluttered microscopic description? The concept of *epistemological emergence* inherited from philosophy, and more particularly from epistemology, offers an interesting theoretical framework to tackle this issue. Since microscopic analysis is not sufficient to explain complex phenomena, scientists need to define and use high-level abstractions to globally represent the system. Abstractions are thus interpreted as *macroscopic observation patterns* that reduce the system's microscopic complexity [1, 8, 9, 13].

In this thesis, we focus on a particular abstraction process, namely the *data aggregation* process. For the abstractions to be interpretable at scale, we propose to quantify and control the complexity reduction and the information losses induced by this aggregation process. Feedback techniques, using measures from information theory such as Shannon entropy and Kullback-Leibler divergence, guarantee that the observer is able to properly interpret the generated macroscopic descriptions. Moreover, to be meaningful, aggregation should fit with the semantic properties of the observed system. Exogenous constraints from the expert domain are exploited to lead the abstraction process. Thus, our aggregation technique allows to build multi-resolution descriptions of the system that both preserve its information content and its semantic properties [2, 10, 11, 14].

The *technical* contribution of our approach is applied to the analysis of very large-scale parallel applications from High Performance Computing. The aggregation technique is successfully applied to the spatial aggregation of one million processes. It reveals anomalies at different levels without going through the complete visualisation of the microscopic level [12]. The *semantic* contribution is applied within an interdisciplinary project (GEOMEDIA) dealing with the understanding of international relations through print media analysis. Spatial and temporal aggregation allows to detect critical events at different scales, thus building strong abstractions to describe the local and global dynamics of the underlying social system [2, 3, 4, 11].

Research Topics

Theory Macroscopic observation of natural and artificial systems, abstraction process, concept of emergence, Artificial Intelligence, epistemology, philosophy of science.
Methods Information theory, complexity theory, information visualisation, statistical analysis, multi-scale analysis, data clustering.
Applications Complex systems, Multi-Agent Systems (MAS), large-scale distributed systems, Geographic Information Systems (GIS), social systems and social sciences.

Academic References

Ph.D. Co-supervisor

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Research Projects

2013-2015 **GEOMEDIA**, *Observatoire des flux géomédiatiques internationaux [Observatory of International Geomediatic Flows]*.

Web site: geomediatic.net

Interdisciplinary project of the French National Research Agency (ANR-CORPUS GEOMEDIA) bringing together geographers and media experts from the International College of Territorial Sciences (CIST, Paris) and computer scientists from the Grenoble Informatics Laboratory (LIG, Grenoble). My role in this project consists in providing abstraction tools (WP3) for the spatial and temporal analysis of international relations through print media (WP4). See publications [3, 2, 4, 11] for more details.

2012-2015 **SONGS**, *Simulation Of Next Generation Systems*.

Web site: infra-songs.gforge.inria.fr

Computer science project of the French National Research Agency (ANR-11-INFRA-13) interested in the simulation of large-scale distributed computing platforms. My role in this project consists in providing abstraction tools to tackle and visualise very large execution traces (WP7). In particular, it leads to the implementation of an aggregation unit within the open-source VIVA software for traces analysis (github.com/schnorr/viva/). See publication [12].

Attended Summer Schools

July 2012 **CSSS'12**, *6th Annual French Complex Systems Summer School*, Paris, France.

Two-weeks intensive introduction to complex behavior in mathematical, physical, living and social systems for graduate students and postdoctoral fellows (courses, tutorials, and group projects, all in English).

July 2011 **EASSS'11**, *13th European Agent Systems Summer School*, Girona, Spain.

One-week forum for knowledge exchange between various research groups in its field. Include a wide range of state-of-the-art courses given by the most prominent researchers in the area.

Reviewing

National Conference with Proceedings

March 2013 **JFSMA'13**, 21^e Journées Francophones sur les Systèmes Multi-Agents [21th French-speaking Days on Multi-agent Systems].

National Journal

July 2011 **Tracé 2012/1, No 22**, *Écologiques. Enquêtes sur les milieux humains* [Ecological Surveys of Human Environments].

Conferences Organisation

June 2012 **ASMTA'12**, 19th International Conference on Analytic and Stochastic Modelling Techniques and Applications, Grenoble, France.

Local organisation committee member: reception of attendants, help in various tasks.

Nov. 2010 - **Déb'ARSH**, Inter-university Project, Grenoble.

April 2011 Documentary projections and debates regarding societal issues. Project co-founder, organisation and conducting of 4 projections and debates.

March 2010 - **Philosophy Club for Students**, Pierre-Mendès-France University, Grenoble.

March 2011 Conferences, debates, presentations of research work, for students in philosophy. Project co-founder, organisation and conducting of 16 events.

Distinction

June 2012 **Best Poster of the Grenoble Informatics Laboratory Ph.D Student Day**, Prize of the jury for short oral communication and poster presentation. See poster [7].

Publications

National Peer-reviewed Journals

- [1] Robin Lamarche-Perrin. Des collaborations possibles entre Intelligence Artificielle et philosophie de l'esprit [Of Possible Collaborations between Artificial Intelligence and Philosophy of Mind]. In Anna C. Zielinska, editor, *Recherches sur la philosophie et le langage*, volume 29, pages 47–65. Vrin, Paris, France, 2013. Forthcoming.

International Peer-reviewed Conferences with Proceedings

- [2] Robin Lamarche-Perrin, Yves Demazeau, and Jean-Marc Vincent. How to Build the Best Macroscopic Description of your Multi-agent System? In Yves Demazeau and Toru Ishida, editors, *Proceedings of the 11th International Conference on Practical Applications of Agents and Multi-Agent Systems (PAAMS'13)*, volume 7879 of *LNCS/LNAI*, pages 157–168. Springer-Verlag Berlin, Heidelberg, 2013. Forthcoming.
- [3] Robin Lamarche-Perrin, Yves Demazeau, and Jean-Marc Vincent. Analysis of News through Spatial and Temporal Aggregation. In Yves Demazeau and Toru Ishida, editors, *Proceedings of the 11th International Conference on Practical Applications of Agents and Multi-Agent Systems (PAAMS'13)*, volume 7879 of *LNCS/LNAI*, pages 295–298. Springer-Verlag Berlin, Heidelberg, 2013. Forthcoming.

National Peer-reviewed Conferences with Proceedings

- [4] Robin Lamarche-Perrin, Yves Demazeau, and Jean-Marc Vincent. Organisation, agrégation et visualisation d'informations médiatiques [Organization, Aggregation, and Visualization of Media Information]. In *Proceedings of the 2011 international conference of the International College of Territorial Sciences (CIST) research group: "Fonder les sciences du territoire"*, pages 240–246, Paris, France, November 2011. <http://www.gis-cist.fr/CIST-Colloque-preactes.pdf>.
- [5] Robin Lamarche-Perrin, Yves Demazeau, and Jean-Marc Vincent. Observation macroscopique et émergence dans les SMA de très grande taille [Macroscopic Observation

of Emergence in Large-scale MAS. In Emmanuel Adam and Jean-Paul Sansonnet, editors, *Proceedings of the 19^{es} Journées Francophones sur les Systemes Multi-Agents (JFSMA '11)*, pages 53–62, Valenciennes, France, October 2011.
<http://hal.inria.fr/hal-00788807/>.

Oral Communications in National Peer-reviewed Conferences without Proc.

- [6] Robin Lamarche-Perrin, Jean-Marc Vincent, and Yves Demazeau. Informational Measures of Aggregation for Complex Systems Analysis. In *Poster Session of the 2012 European Conference on Complex Systems (ECCS'12)*, Brussels, Belgium, September 2012.
http://magma.imag.fr/sites/default/files/users/Robin%20Lamarche-Perrin/lpdv12_lig.pdf.
- [7] Robin Lamarche-Perrin, Jean-Marc Vincent, and Yves Demazeau. Informational Measures of Aggregation for Complex Systems Analysis. In *Poster Session of the 2012 Ph.D Student Day of the Grenoble Informatics Laboratory (LIG)*, Grenoble, France, June 2012.
http://magma.imag.fr/sites/default/files/users/Robin%20Lamarche-Perrin/lpdv12_lig.pdf.
- [8] Robin Lamarche-Perrin. Des collaborations possibles entre Intelligence Artificielle et philosophie de l'esprit [Of Possible Collaborations between Artificial Intelligence and Philosophy of Mind]. In *The 3rd young researchers conference of the Philosophie, Langages & Cognition (PLC) research group: "Repenser les rapports entre science(s) et philosophie"*, Grenoble, France, June 2011.
- [9] Robin Lamarche-Perrin. Conceptualisation de l'émergence : dynamiques microscopiques et analyse macroscopique des SMA [Conceptualizing Emergence: Microscopic Dynamics and Macroscopic Analysis of MAS]. In *The FUTURAMA Workshop of the 2011 AFIA Platform: "Futur des Agents et des Multi-Agents"*, Chambéry, France, May 2011.
magma.imag.fr/sites/default/files/users/Robin%20Lamarche-Perrin/lp11_futurama.pdf.

Other Reports

- [10] Robin Lamarche-Perrin, Yves Demazeau, and Jean-Marc Vincent. The Best-partitions Problem: How to Build Meaningful Aggregations? Research Report RR-LIG-XXX, Grenoble Informatics Laboratory (LIG), France, February 2013. Forthcoming
http://magma.imag.fr/sites/default/files/users/Robin%20Lamarche-Perrin/lpyv13_lig.pdf.
- [11] Robin Lamarche-Perrin, Yves Demazeau, and Jean-Marc Vincent. How to Build the Best Macroscopic Description of your Multi-agent System? Application to News Analysis of International Relations. Research Report RR-LIG-035, Grenoble Informatics Laboratory (LIG), France, January 2013.
http://rr.liglab.fr/research_report/RR-LIG-035_orig.pdf.
- [12] Robin Lamarche-Perrin, Lucas M. Shnorr, Jean-Marc Vincent, and Yves Demazeau. Evaluating Trace Aggregation Through Entropy Measures for Optimal Performance Visualization of Large Distributed Systems. Research Report RR-LIG-037, Grenoble Informatics Laboratory (LIG), France, December 2012.
http://rr.liglab.fr/research_report/RR-LIG-037_orig.pdf.
- [13] Robin Lamarche-Perrin. Des collaborations possibles entre philosophie et Intelligence Artificielle [Of Possible Collaborations between Philosophy and Artificial Intelligence]. Master's thesis, 2nd year of Master in Philosophy, supervised by Denis Perrin, Pierre-Mendès-France University, Grenoble, September 2012.
<http://dumas.ccsd.cnrs.fr/dumas-00745591>.
- [14] Robin Lamarche-Perrin, Jean-Marc Vincent, and Yves Demazeau. Informational Measures of Aggregation for Complex Systems Analysis. Research Report RR-LIG-

026, Grenoble Informatics Laboratory (LIG), France, July 2012.
http://rr.liglab.fr/research_report/RR-LIG-026.pdf.

- [15] Robin Lamarche-Perrin, Yves Demazeau, and Jean-Marc Vincent. Macroscopic Observation of Multiagent Systems. Research Report RR-LIG-010, Grenoble Informatics Laboratory (LIG), France, March 2011.
http://rr.liglab.fr/research_report/RR-LIG-010.pdf.
- [16] Robin Lamarche-Perrin. Le Test de Turing pour évaluer les theories de l'esprit [Using the Turing Test to Evaluate the Theories of Mind]. Master's thesis, 1st year of Master in Philosophy, supervised by Max Kistler, Pierre-Mendès-France University, Grenoble, September 2010.
<http://dumas.ccsd.cnrs.fr/dumas-00611171/>.
- [17] Robin Lamarche-Perrin. Observation macroscopique pour l'analyse de systèmes multi-agents de très grande taille [Macroscopic Observation for the Analysis of Large-Scale Multi-Agent Systems]. Master's thesis, 2nd year of Master in Computer Science, supervised by Jean-Marc Vincent and Yves Demazeau, Grenoble Informatics Laboratory, Joseph Fourier University, Grenoble, June 2010.
http://magma.imag.fr/sites/default/files/users/Robin%20Lamarche-Perrin/lp10_ujf.pdf.